INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

Monthly Highlights

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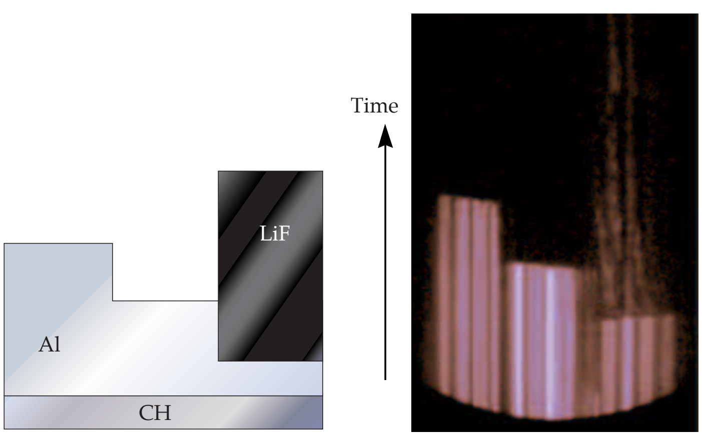
NIF LTAB. The shell of the NIF Laser and Target Area Building (LTAB) continues toward completion by Nielsen Dillingham, Inc. The 2.5-ft.-thick concrete wall for switchyard #2 has been poured to the +35-ft. level and formed to the +51-ft. level. The wall for the Target Area building has been poured to the +16.5-ft. level. The diagnostic building's basement walls have been poured to ground level, and the interior structural steel has been inserted.

The NIF LTAB in January 1999, as seen from the Target Area end.

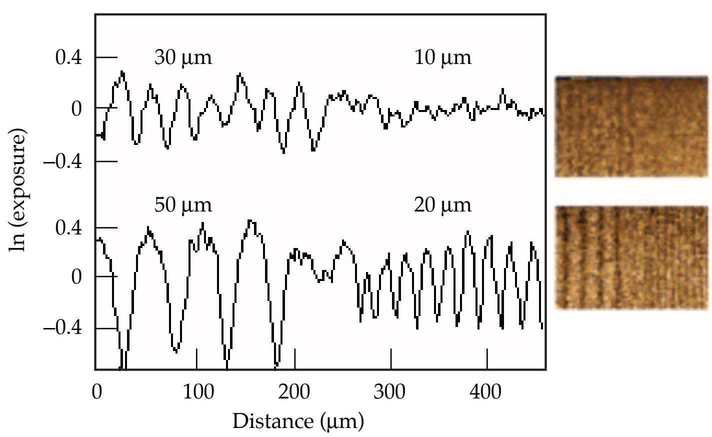
VISAR Installed on OMEGA Laser. A VISAR (velocity interferometry system for any reflector) has been installed at the University of Rochester's OMEGA laser facility to study shocks in materials. Shown below is an example of the streaked data from a stepped target used for equation-of-state (EOS) studies, demonstrating good shock planarity. The instrument uses a table-mounted interferometer with collection optics mounted in a ten-inch manipulator. In addition to the EOS studies, the system will support upcoming weapons physics and ICF shock timing experiments on OMEGA.



Streaked VISAR data on OMEGA showing good shock planarity.

NIF Optical Fiber Developed. The NIF precision power diagnostic design uses a high-bandwidth, low-attenuation, graded-index, ultraviolet-transmitting (351-nm) optical fiber, which has been developed by the Vavilov State Optical Institute, St. Petersburg, Russia. Such fibers, up to 40 m in length, transmit optical signals to transient digitizers. In order to meet NIF requirements, the fibers must contain many modes to reduce speckle noise: this can be accomplished with bundles of 19 100-µm-core fibers accurately cut to give the same time delay (±25 ps). With our Russian colleagues, we have recently demonstrated a cheaper and better solution using an equivalent 435-µm-core fiber. By carefully grading the index profile and controlling impurities, we have demonstrated that such a large-core fiber can have a dispersion of <1 ps/m and an attenuation <150 dB/km at 351 nm, meeting NIF requirements.

Rayleigh–Taylor Experiments Completed. We have performed the first conclusive steady-state measurements of the short-wavelength cutoff for indirectly driven Rayleigh–Taylor instability growth. The measurements were done on an aluminum package with perturbations of varying initial wavelengths. The hohlraum drive was engineered to provide a constant acceleration for ~2 ns. Shown below are two images of the raw data alongside lineouts in units proportional to optical depth, at $t \approx 5$ ns, showing strong growth at wavelengths of 20, 30, and 50 μm and little growth at 10 μm. This confirms an important stabilization effect for ablatively accelerated material.



Amplitude of perturbations at several wavelengths for RT instability at an aluminum ablation front.

For comments about content of the *Monthly Highlights*, contact Bob Kauffman (925) 422-0419.
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